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(54) **A jockey wheel drive assembly**

(57) A jockey wheel drive assembly comprising drive means e.g. electric motor to drive the jockey wheel (22) and a reduction gearing arrangement in the form of a plurality of intermeshed gears (60, 56) to the drive means to the jockey wheel (22) to transmit torque from the drive means to the jockey wheel. The drive assembly is particularly suitable for facilitating the manipulation of vehicle trailers such as caravans when they have been uncoupled from the towing vehicle.

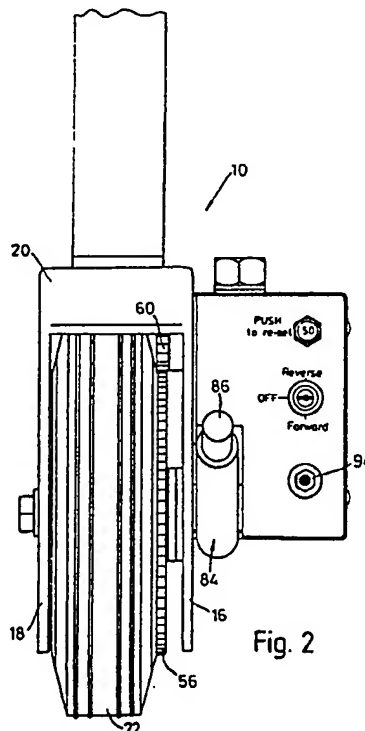


Fig. 2

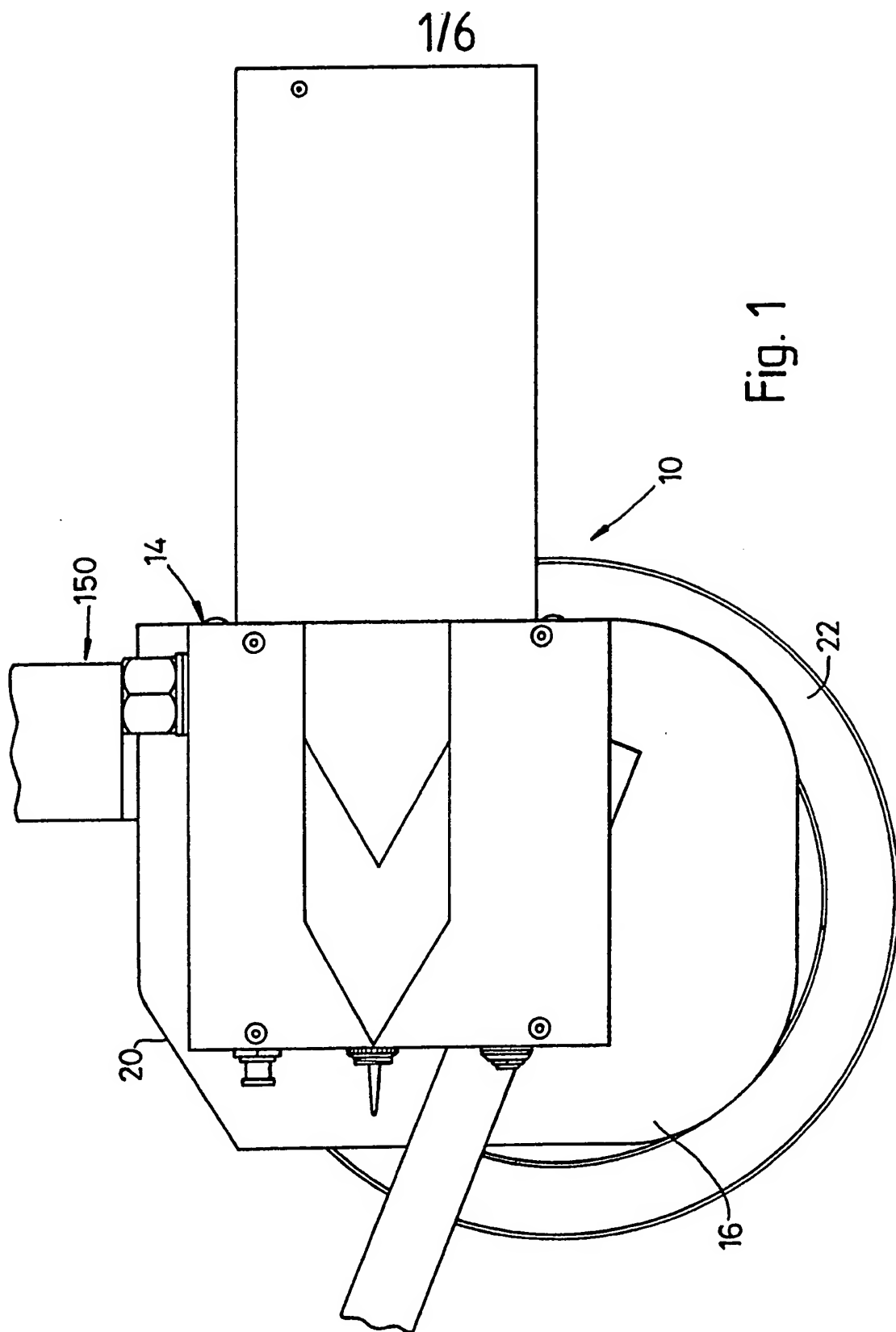
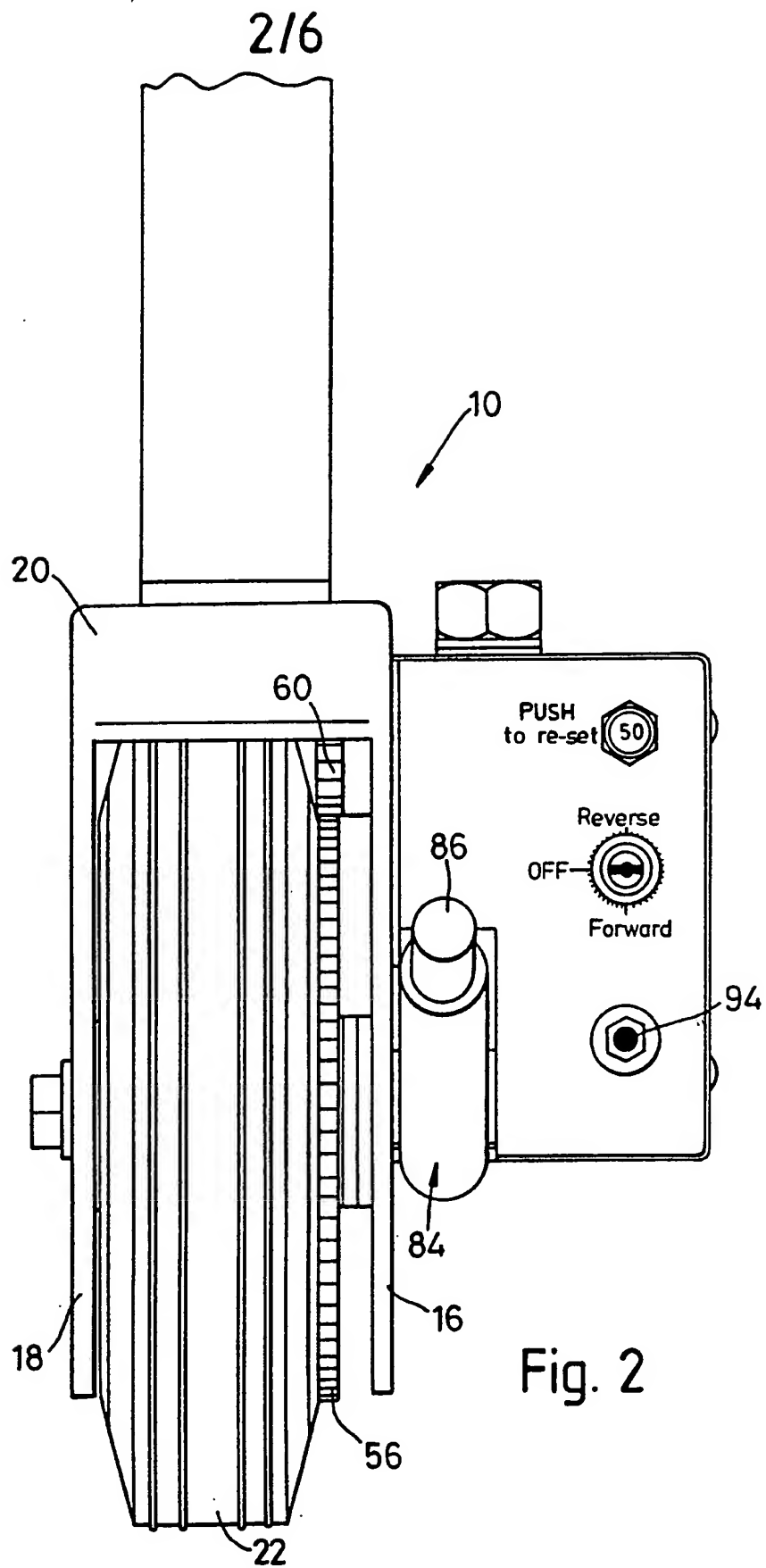


Fig. 1



3/6

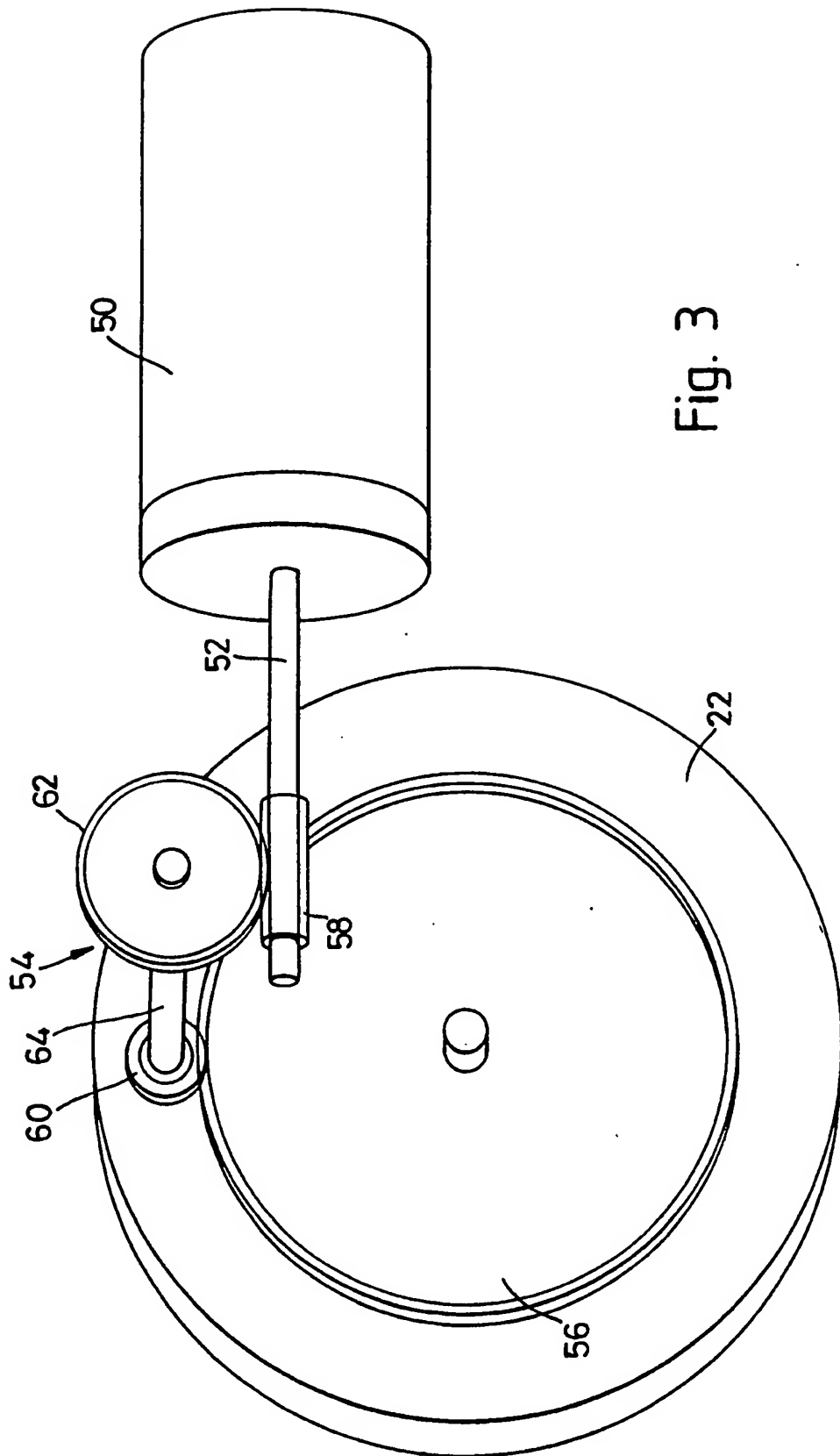


Fig. 3

4/6

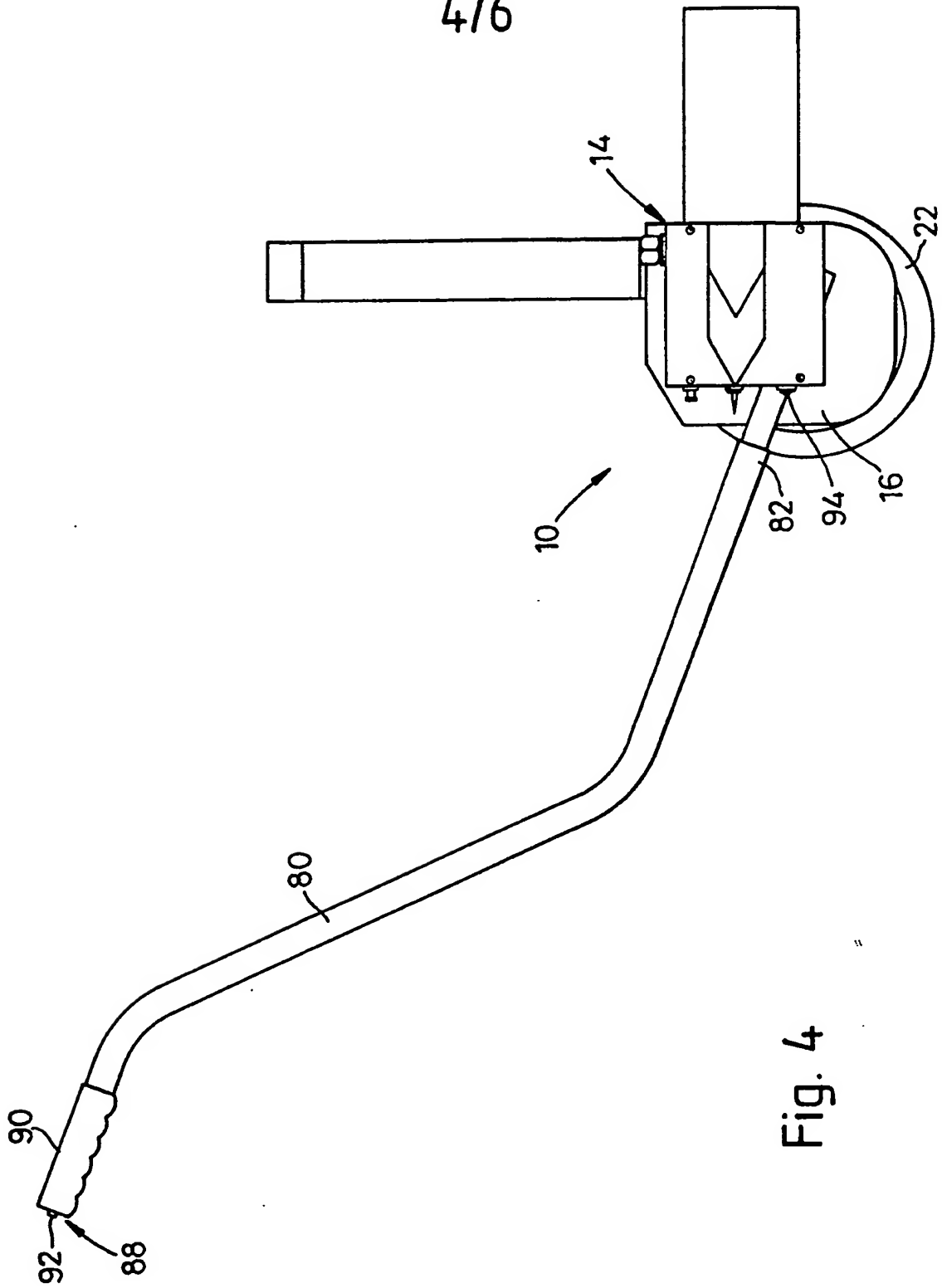


Fig. 4

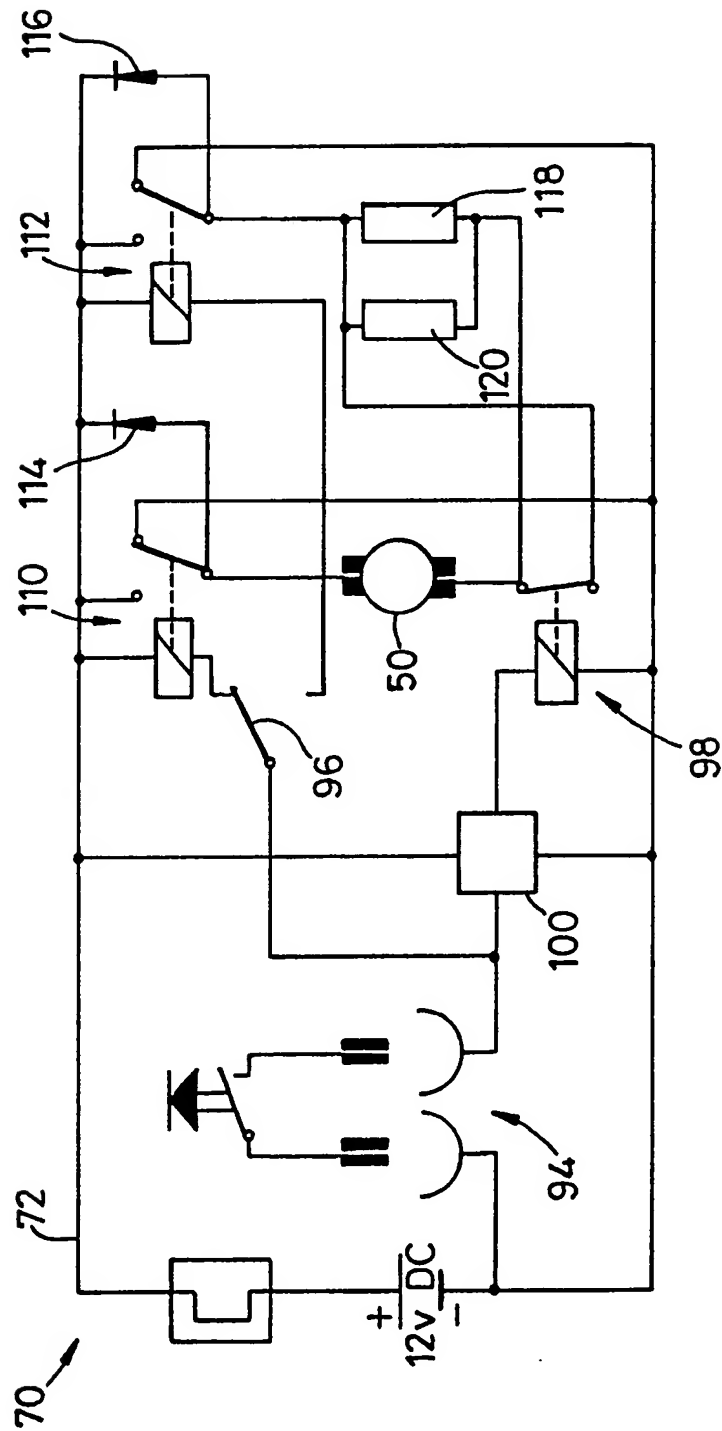


Fig. 5

6/6

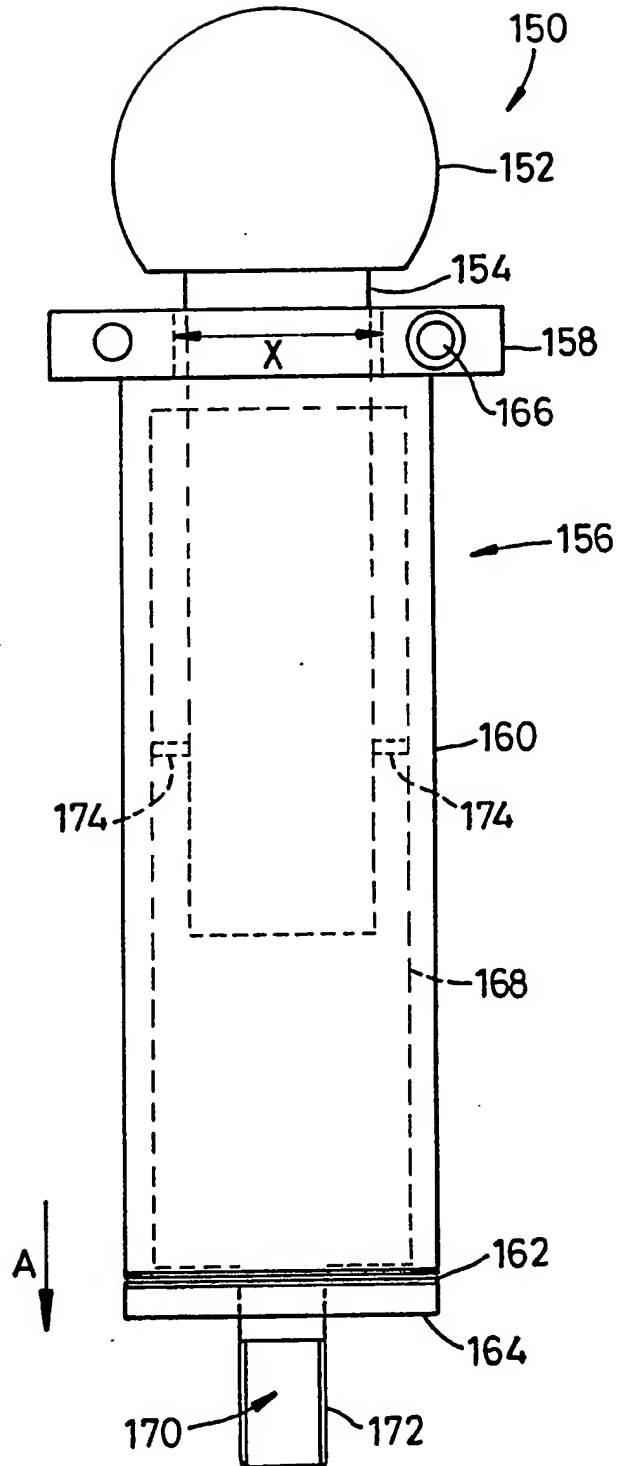


Fig. 6

A JOCKEY WHEEL DRIVE ASSEMBLY

This invention relates to jockey wheel drive assemblies and to apparatus for manipulating vehicle trailers.

When vehicle trailers, such as caravans, boat trailers or the like have been uncoupled from their towing vehicles, it is often necessary to manipulate them across ground to a desired location. To assist such manipulation, trailers are provided with jockey wheels on the towing frame.

However, the manipulation of vehicle trailers across ground involves the expenditure of effort sometimes by more than one person. This can be exacerbated if the ground is not level, is rough or the trailer is heavy.

It is an object of this invention to provide a jockey wheel drive assembly to overcome the above problems.

According to one aspect of this invention, there is provided a jockey wheel drive assembly for use with a jockey wheel of a vehicle trailer, said jockey wheel

drive assembly comprising drive means adapted to drive the jockey wheel and a reduction gearing arrangement to gear the drive means to the jockey wheel to transmit torque from the drive means to the jockey wheel.

The reduction gearing arrangement may have a gear ratio in the range of between 100 to 1 and 200 to 1, preferably between 125 to 1 and 175 to 1, more preferably is substantially 150 to 1.

The reduction gearing arrangement may comprise a first gear which can be mounted on the jockey wheel and a second gear which may be driven directly by the drive means, preferably the second gear is a worm. The gearing arrangement may also comprise a third gear meshed with the first gear and a fourth gear meshed with the second gear. The third and fourth gears may be fixedly attached together, preferably by an elongate shaft.

The drive means may be a motor, which motor is preferably an electric motor.

Preferably the drive assembly further comprises control means to control the drive means, and may also comprise actuating means to actuate the drive means. The

actuating means may be connected via control means to the drive means . The control means may comprise delay means to delay, by preferably 2 to 3 seconds, full power being transmitted to the drive means upon actuation of the drive means. More preferably, the delay means is adapted to delay full power to the drive means by substantially 2.5 seconds.

When the drive means is actuated, minimal power may be initially transmitted to the drive means and after a delay imparted thereto by the delay means, full power may be transmitted to the drive means.

The delay means is preferably part of an electric circuit and may comprise at least one of the following: a timer, a relay and at least one resistor.

Preferably, the actuating means comprises a first switch movable between an actuating position and a non-actuating position, wherein the first switch may return automatically to the non-actuating position upon release thereof.

The drive assembly preferably further comprises braking means which may be adapted to stop the jockey wheel upon release of the first switch. Preferably the braking means may be connected to the drive means and may comprise an electronic brake.

Preferably, the drive assembly comprises a second switch in association with the first switch and with the delay means. In a preferred embodiment of the invention the second switch may be movable between an actuating position, a forward position whereby the drive means can drive the jockey wheel forward, and a reverse position whereby the drive means can drive the jockey wheel in reverse.

According to another aspect of this invention there is provided apparatus for manoeuvring a vehicle trailer, said apparatus comprising a jockey wheel and a jockey wheel drive assembly as described above.

Advantageously, the apparatus is adapted to be detachably secured to the vehicle trailer.

Preferably the apparatus comprises a housing to house the drive assembly and the jockey wheel. Preferably, the housing comprises opposed side walls arranged on either side of the jockey wheel. The housing may also comprise a front or rear member attached between the side walls to impart rigidity thereto.

According to another aspect of this invention there is provided a coupling assembly suitable for coupling an apparatus for manoeuvring a vehicle trailer as described above to a socket of a towing bracket of a vehicle trailer, said coupling assembly comprising a coupling member adapted to be received by the socket and socket engaging means adapted to be adjusted relative to the coupling member such that when the coupling member is received by the socket, the socket engaging means can engage the socket thereby to restrict movement of said docket relative to the coupling member.

Preferably the socket engaging means comprises a collar movable relative to said coupling member and desirably an outer member movable relative to said coupling member, which outer member can engage the collar.

Packing means may be provided to adjust the socket engaging means and to maintain the socket engaging means in engagement with the socket when the coupling member is received thereby. Preferably, the packing means comprises a plurality of washers to engage the outer member.

An inner member may be provided relative to which the socket engaging means can slide. The coupling member may be mounted at one end of the inner member and a housing engaging member may be attached to the other end to engage the housing of the apparatus for manoeuvring a vehicle trailer as described above.

The housing engaging means preferably comprises an elongate member having a threaded portion to enable the coupling member to be secured to the housing. The packing means may be adapted to be fitted to the housing engaging means whereby when the housing engaging means is engaged with the housing, the packing means can be disposed between the housing and the outer member to maintain the socket engaging means in engagement with the socket when the coupling member is received thereby.

Preferably a coupling member support means is provided to support the coupling member. The coupling member support means is preferably attached to the inner member, which attachment may be suitable by fixing means such as pins.

Reference is now made to the accompanying drawings in which:-

Figure 1 is a side view of apparatus for manipulating a vehicle trailer according to one aspect of this invention;

Figure 2 is a front view of the apparatus shown in Figure 1;

Figure 3 is a schematic view of a jockey wheel drive assembly according to another aspect of the invention;

Figure 4 is a side view similar to Figure 1 but on a smaller scale and showing the securing means and the steering means;

Figure 5 is a circuit diagram of control means which can be used in this invention; and

Figure 6 is a side view of a coupling assembly according to another aspect of this invention.

Referring to Figures 1,2 and 4, apparatus 10 for manipulating a vehicle trailer is shown. The apparatus 10 comprises a jockey wheel drive assembly 12 comprising a drive means 50, a reduction gearing arrangement 54 (see Figure 3) and a control means 70 (see Figure 5), and a jockey wheel 22. The jockey wheel drive assembly 12 and the jockey wheel 22 are mounted within a housing 14 which comprises two opposed side walls 16,18 (see Figure 2) and a front member 20. The front member 20 is to impart rigidity to the housing 14.

Referring now to Figure 3, the drive means 50 is shown schematically. The drive means 50 comprises a motor. A suitable such motor as an electric motor, for example a 12 volt electric motor.

The drive means 50 is connected via shaft 52 to a reduction gearing arrangement 54, comprising a first gear 56, a second gear in the form of a worm 58, and third and fourth gears 60,62 respectively. The first, third and fourth gears are all in the form of gear wheels.

The third and fourth gears 60,62 are fixedly attached together by means of an elongate shaft 64 and the first gear is fixedly mounted on the jockey wheel 22. Thus, when the drive means 50 is actuated as explained below, it causes the shaft 52 to rotate and, thereby, the worm 58 is rotated. The fourth gear 62 is rotated by the worm 58 via the meshing therebetween which, by virtue of the shaft 64, rotates the third gear 60. The first gear 56 is rotated by the third gear 60 via the meshing therebetween and, thus, the jockey wheel 22 is driven. The overall gear ratio of the embodiment shown is substantially 150 to-1.

Referring to Figure 4, a steering means in the form of an elongate handle 80 is provided, having a proximal end 82 which can be connected to the jockey wheel 22. Cross-referencing Figure 2 with Figure 4, it will be seen that the apparatus 10 comprises a connecting member 84 to connect the handle 80 to the jockey wheel 22 by any means well known in the art.

The connecting member 84 and the proximal end 82 of the handle 80 are provided with co-operating formations to enable the handle 80 to be attached to the connecting member 84. In the embodiment shown, the connecting

member 84 is provided with a male mating portion 86 which can be received in an appropriate female mating portion (not shown) provided in the proximal end 82 of the handle 80. Suitable securing means can then be used to secure the handle 80 to the connecting member 84. An example of such securing means is a split pin (not shown) which can be passed through apertures (not shown) provided in the proximal end 82 of the handle 80 and in the male mating portion 86. When the male mating portion 86 is fully received within the female mating portion, the apertures are aligned to allow the split pin to be passed therethrough.

The handle 80 also has a distal end 88 upon which a hand grip 90 is mounted. A first switch in the form of a button 92 is provided. The button 92 is electrically connected to a jack plug (not shown) which can be inserted into a jack plug socket 94 to connect the button 92 to the control means 70 as will be explained below. The button 92 operates a braking means in the form of an electronic brake to stop the drive means 50 immediately the button 92 is released.

Referring to Figure 5, the control means 70 is shown which consists of an electrical circuit 72, comprising a second switch 96 in electrical communication with the socket 94. The second switch 96 is movable between a non-actuating position, a forward position and a reverse position, whereby when the switch 96 is in the forward position, the apparatus 10 can be driven forward and when the switch 96 is in the reverse position, the apparatus 10 can be driven in reverse. The second switch 96 and the socket 94 are both connected to delay means comprising two resistors 118 and 120, first relay 98 and a timer 100. The resistors 118 and 120 are both 10 ohm resistors having a tolerance of 5% and a 50 watt rating which are adapted to delay by substantially 2.5 seconds the transmission of full power to the drive means 50. The relay 98 is a 35A single pole relay with a 12v coil.

Thus, when the first switch 92 is moved to its actuating position and the second switch 96 is moved either to its forward or reverse position, the transmission of only minimal power to the drive means; the transmission of full power is delayed by substantially 2.5 seconds. This results in an initial

slow start of the jockey wheel to prevent wheel spin. After the delay, full power is transmitted to the drive means 50.

The circuit 72 is also provided with second and third relays 110,112 which comprise respectively diodes 114,116 which work in conjunction with the resistors 118,120 to act as a snubbing circuit to reduce the arc on second and third relays 110,112. The relays 110,112 are comprised in a single unit and are sold under the designation G17518903. The relays 110,112 are a 35A single pole changeover relay with a 12V coil. The relays 110,112 enable the second switch 96 to cause the drive means 50 to move the jockey wheel 22 in the forward or reverse direction.

The diodes 114,116 also have the function that they act as an electronic brake for the drive means 50 when the button is released and allowed to move to its non-actuating position. The electronic brake works by the use of back emf and, as such, the button 92 acts as a "dead man's handle" to stop the jockey wheel as soon as the button 92 is released.

A 50A thermal cut out 130 is also provided.

The apparatus 10 also comprises a coupling assembly to couple the apparatus 10 to the towing frame of a vehicle trailer. Where the trailer (not shown) comprises a socket for a conventional tow ball, the coupling assembly can couple with the socket. Alternatively, the coupling assembly can be coupled to an independent socket attached to the towing frame.

Figure 6 shows a coupling assembly 150 suitable for coupling the apparatus 10 to a vehicle trailer as described above.

The coupling assembly 150 comprises a coupling member 152 in the form of a three quarter sphere as shown in Figure 6. The coupling member 152 can be received by the socket of a towing bracket of a vehicle trailer. The coupling member 152 is mounted on a coupling member support member 154.

The coupling assembly 150 also comprises a socket engaging means 156 in the form of a collar 158 which is slidable on the support member 154 and a substantially cylindrical member 160 which is also slidable on the support member 154. The function of the socket engaging means 156 is to engage the socket of the towing frame of

the vehicle trailer when the coupling member 152 is received in the socket. In this way, the socket engaging means 156 restricts movement of the socket and thus reduces any tendency towards rocking movement as the trailer is being manoeuvred.

When the coupling member 152 is received in the socket of the trailer towing frame, the collar 158 is held against the socket by a plurality of packing members in the form of washers 162 disposed between the substantially cylindrical member 160 and a thicker washer 164. By varying the number of washers 162 between the cylindrical member 160 and the thicker washer 164, the position of the collar 158 can be adjusted so that it can engage different sizes of sockets.

The collar 158 is substantially annular shaped and is divided into two pieces, these pieces being secured together by securing means 166 which can be, for example, an allen key bolt. By releasing the securing means 166, the collar can be removed.

The coupling assembly 150 also comprises an inner member 168 at one end of which is attached a housing engaging means in the form of an elongate member 170

having a threaded portion 172. The elongate member 170 can be received in a suitable aperture in the housing of the apparatus 10. A washer can then be fitted onto the elongate member 170 and a nut threaded thereon to secure the coupling assembly 150 to the apparatus 10.

In order to remove the washers 162, 164 from the coupling assembly 150, the coupling assembly 150 is first removed from the housing and the washers 162, 164 can then be slid over the elongate member 170 in the direction of arrow A. This enables the number of washers 162 to be varied. The outer member 160 can also be removed by sliding it over the elongate member 170 in the direction of arrow A. The collar 158 cannot be removed in this way because the inner diameter X thereof is narrower than the diameter of the inner member 168. The outer diameter Y of the collar 158 is such that the collar 158 can engage the socket of the towing bracket of the vehicle to be manoeuvred when the coupling member 152 is received in the socket.

As indicated above the coupling member 152 is mounted on the coupling member support member 154. The coupling member support member 154 is attached to the inner member 168 by fixing means such as pins 174. If

one cross-references Figure 6 with Figure 1, the position of the coupling assembly 150 on the apparatus 10 is shown.

CLAIMS

1. A jockey wheel drive assembly for use with a jockey wheel of a vehicle trailer, said drive assembly comprising drive means adapted to drive the jockey wheel and a reduction gearing arrangement to gear the drive means to the jockey wheel to transmit torque from the drive means to the jockey wheel.

2. A drive assembly according to Claim 1 wherein the reduction gearing arrangement has a gear ratio in the range of between 100 to 1 and 200 to 1, preferably between 125 to 1 and 175 to 1 and, more preferably, is substantially 150 to 1.

3. A drive assembly according to Claim 1 or 2 wherein the reduction gearing arrangement comprises a first gear adapted to be mounted on the jockey wheel and a second driven by the drive means.

4. A drive assembly according to Claim 3 wherein the reduction gearing arrangement further comprises a third gear meshed with the first gear and a fourth gear fixedly attached to the third gear, said fourth gear being meshed with the second gear.

5. A drive assembly according to Claim 3 or 4 wherein the second gear comprises a worm.

6. A drive assembly according to any preceding claim wherein the drive means comprises a motor, preferably an electric motor.

7. A drive assembly according to any preceding claim further comprising control means to control the drive means.

8. A drive assembly according to Claim 7 further comprising actuating means to actuate the drive means, said actuating means being connected via the control means to the drive means wherein the control means comprises delay means to connect the actuating means to the drive means, whereby when the drive means is actuated, minimal power is initially transmitted to the drive means and after a delay imparted thereto by the delay means full power is transmitted to the drive means.

9. A drive assembly according to Claim 8 wherein the delay means is adapted to delay the transmission of full power to the drive means by 2 to 3 seconds, preferably substantially 2.5 seconds.

10. A drive assembly according to Claim 8 or 9 wherein the delay means comprise a timer and a relay in association with at least one resistor.

11. A drive assembly according to any of Claims 8 to 10 wherein the actuating means comprises a first switch movable between an actuating position and a non-actuating position wherein the first switch returns automatically to the non-actuating position upon release thereof.

12. A drive assembly according to Claim 11 further comprising braking means adapted to stop the jockey wheel upon release of the first switch.

13. A drive assembly according to Claim 12 wherein the braking means comprises an electronic brake connected to the drive means.

14. A drive assembly according to any of Claims 8 to 13 comprising detachable steering means to steer the jockey wheel, wherein the actuating means is mounted upon the steering means.

15. A drive assembly according to Claim 14 wherein the steering means comprises an elongate handle having a distal end with the actuating means mounted therein and a proximal end adapted to be connected to the jockey wheel.

16. Apparatus for manoeuvring a vehicle trailer, said apparatus comprising a jockey wheel and a jockey wheel drive assembly as claimed in any of Claims 1 to 15.

17. Apparatus according to Claim 16 adapted to be detachably coupled to the vehicle trailer.

18. Apparatus according to Claim 16 or 17 further comprising a housing to house the drive assembly and the jockey wheel, said housing comprising opposed side walls disposed either side of the jockey wheel and a front or rear member attached between the side walls to impart rigidity thereto.

19. A coupling assembly for coupling an apparatus as claimed in any of Claims 16 to 18 to a socket of a towing bracket of a vehicle trailer, said coupling assembly comprising a coupling member adapted to be received by the socket and socket engaging means adapted to be adjusted relative to the coupling member such that

when the coupling member is received by the socket, the socket engaging means can engage the socket thereby to restrict movement of the socket relative to the coupling member.

20. A coupling assembly according to Claim 19 wherein the socket engaging means comprises a collar movable relative to the coupling member and an outer member movable relative to the coupling member, which outer member can engage the collar.

21. A coupling assembly according to Claim 20 comprising packing means to adjust the socket engaging means and to maintain the socket engaging means in engagement with the socket when the coupling member is received thereby.

22. A coupling assembly according to Claim 21 wherein the packing means comprises a plurality of washers to engage the outer member.

23. A coupling assembly according to Claim 21 or 22 comprising an inner member relative to which the socket engaging means can slide, the coupling member being mounted at one end of the inner member and a

housing engaging means being attached at the other end of the inner member, said housing engaging means being adapted to engage the housing of the apparatus as claimed in any of claims 16 to 18.

24. A coupling assembly according to Claim 23 wherein the housing engaging means comprises an elongate member having a threaded portion to enable the coupling member to be secured to the housing; the packing means being adapted to be fitted onto the housing engaging means whereby when the housing engaging means is engaged with the housing the packing means can be disposed between the housing and the outer member to maintain the socket engaging means in engagement with the socket when the coupling member is received thereby.

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